

REMARKS/ARGUMENTS

In response to the Office Action dated January 24, 3002, Claims 1-27 are now in this application. The specification has been amended. Claims 1 and 19 have been amended. Claim 27 has been added.

Claim 1 was objected to.

Claims 1-17, 19-26 were rejected under 35 USC 102(e).

Claims 2, 4, 7-18, 15-18, 21-24, and 26 were rejected under 35 USC 103(a).

Claims 1-26 were rejected under obviousness-type double-patenting.

No new matter has been added. Reexamination and reconsideration of the amended application is requested.

Claim Objections

Claim 1 has been objected to, because it was not clear why a colon was present in line 4. This has been clarified by the addition of the phrase "an article comprising" before the colon, in order to overcome the objection.

Claim Rejections - 35 USC § 102

First Rejection: Claims 1-17 and 19-26 are rejected under 35 USC 102(e) as being anticipated by Sandhu (U.S. Patent No. 5,599,396).

Independent Claim 1 is directed to a window electrode that is sufficiently conductive to be an electrode AND sufficiently resistive to permit coupling therethrough of power from an external coil. (See the Specification at page 33 lines 23-31 and page 42 lines 10-15.) The invention was enabled by the discovery that a semiconductor such as silicon could be carefully doped to satisfy both these conditions. Sandhu has no relevant

disclosure. Sandhu discloses a ceiling that can be CHANGED between (A) being a conductive electrode which is unable to be a window through which inductive power can be coupled and (B) being non-conductive window through which inductive power can be coupled but which is UNABLE to be an electrode because of its lack of conductivity. Sandhu therefore discloses changing between two conventional but opposite types of ceilings. Whenever the hollow interior of the Sandhu ceiling is filled by the conductive liquid, it functions as a conductive electrode, but blocks an inductive field from the external coil (as would any conductor). Whenever the conductive fluid is withdrawn from the ceiling, the ceiling does not block the inductive field, but it is then incapable of functioning as an electrode. Therefore, the Examiner's characterization of the Sandhu apparatus as a "window electrode" is without any basis, and the Examiner's allegation that the Sandhu apparatus is simultaneously a window AND an electrode is a physical impossibility, at least for the Sandhu embodiment employing a conductive fluid. As for Sandhu's other embodiment employing a variable conductivity material, Sandhu teaches using both embodiments in the same manner, i.e., either in a fully conductive state or in a fully insulative state. Any in-between state is inconsistent with Sandhu's teachings.

Claim 1 is directed to a window electrode capable of being simultaneously a window for inductive power AND an electrode. Sandhu cannot meet the conjunctive term "and" in Claim 1, nor the term "window electrode" in Claim 1. Accordingly, Claim 1 is clearly not anticipated by Sandhu, and is therefore patentable over Sandhu.

Claims 2-12 depend from Claim 1 and are therefore patentable over Sandhu upon the same basis.

Independent Claim 13 is directed to a window electrode that

is sufficiently conductive to be an electrode AND sufficiently resistive to permit coupling therethrough of power from an external coil. (See the Specification at page 33 lines 23-31 and page 42 lines 10-15.) The invention was enabled by the discovery that a semiconductor such as silicon could be carefully doped to satisfy both these conditions. Sandhu has no disclosure relevant to Claim 13. Sandhu discloses a ceiling that can be CHANGED between (A) being a conductive electrode which is UNABLE to be a window through which inductive power can be coupled and (B) being non-conductive window through which inductive power can be coupled but which is UNABLE to be an electrode because of its lack of conductivity. Sandhu therefore discloses changing between two conventional but opposite types of ceilings. Claim 13 is directed to a window electrode that is simultaneously a window (for inductive power) AND an electrode. Sandhu cannot meet the term "window electrode" in Claim 13. Accordingly, Claim 13 is clearly not anticipated by Sandhu, and is therefore patentable over Sandhu.

Claims 14-17 depend from Claim 13 and are therefore patentable over Sandhu upon the same basis.

Independent Claims 19 and 20 are each directed to a window electrode that is sufficiently conductive to be an electrode AND sufficiently resistive to permit coupling therethrough of power from an external coil. (See the Specification at page 33 lines 23-31 and page 42 lines 10-15.) The invention involved the discovery that a semiconductor such as silicon could be carefully doped to satisfy both these conditions. Sandhu has no relevant disclosure. Sandhu discloses a ceiling that can be CHANGED between (A) being a conductive electrode which is unable to be a window through which inductive power can be coupled and (B) being non-conductive window through which inductive power can be coupled but which is UNABLE to be an electrode because of its

lack of conductivity. Sandhu therefore discloses changing between two conventional but opposite types of ceilings. Claims 19 and 20 are directed to a window electrode that is simultaneously a window (for inductive power) AND an electrode. Sandhu cannot meet the term "window electrode" in Claims 19 and 20. Accordingly, Claims 19 and 20 are clearly not anticipated by Sandhu, and are therefore patentable over Sandhu.

Claims 21-26 depend from Claim 20 and are therefore patentable over Sandhu upon the same basis.

Therefore, withdrawal of the rejection of Claims 1-17 and 19-26 under 35 USC 102(e) is respectfully requested based upon the foregoing.

Second Rejection: Claims 1, 3, 5-6, 9-14, 19-20, and 25 are rejected under 35 USC 102(e) as being anticipated by Blalock (U.S. Patent No. 5,779,849).

(A.) CLAIMS 1, 3, 5, 6 and 9-14:

Claims 1, 3, 5, 6 and 9-14 are entitled under 35 USC 120 to the filing date of June 27, 1991 of U.S. application Serial No. 07/722,340 as set forth below and in the attached declaration of Kenneth S. Collins.

(1.) CONTINUITY OF DISCLOSURE:

In general, the parent, grandparent and great-grandparent applications of the present application share the common disclosure of FIGS. 4D, 16 and 17A, in which a semiconductor (silicon) ceiling or dome serves simultaneously as both an electrode and a window through which power is inductively coupled from an external coil antenna. The three lineal ancestors of these applications, dating back to 1991, share the common disclosure of the same concept at Column 7 lines 34-39 of U.S. Patent No. 5,556,501, pertaining to a silicon dome connected to

an RF source, an external coil antenna facing the dome.

More specifically, independent Claims 1 and 13 are each supported by disclosure in the specification at page 33 lines 25-31: "... the ceiling 52 may be a semiconductor (e.g., silicon) material doped so that it will act as an electrode capacitively coupling the RF bias power applied to it into the chamber 40 and simultaneously as a window through which RF power applied to the solenoid 42 may be inductively coupled into the chamber."

Disclosure supporting Claims 1 and 13 is contained in the parent of the present application, namely Serial No. 08/733,555 filed Oct. 1, 1996, now U.S. Patent No. 6,063,233. This disclosure is found in said U.S. Patent No. 6,063,233 at column 15 line 64 through column 16 line 2.

Disclosure supporting Claims 1 and 13 is contained in the parent of the above-referenced Serial No. 08/733,555, namely Serial No. 08/648,254 filed May 13, 1996, now U.S. Patent No. 6,165,311. This disclosure is found in said U.S. Patent No. 6,165,311 at column 16 line 64 through column 17 line 2.

Disclosure supporting Claims 1 and 13 is contained in the parent of the above-referenced Serial No. 08/648,254, namely Serial No. 08/520,026 filed Dec. 20, 1995, which is a continuation of Serial No. 08/041,796 filed April 1, 1993, which is a continuation of U.S. Serial No. 07/722,340 filed Jun. 27, 1991.

The last three applications referred to in paragraph 5 above, namely Serial No. 08/520,026, Serial No. 08/041,796 and Serial No. 07/722,340, are continuation applications and have virtually identical specifications so that the disclosure of one is effectively the same as the disclosure of the other. Serial No. 08/041,796 issued as U.S. Patent No. 5,556,501, and therefore the specification of the aforesaid U.S. Patent No. 5,556,501 is the same as the specification of the last three applications

referred to in paragraph 5 above, namely Serial No. 08/520,026, Serial No. 08/041,796 and Serial No. 07/722,340.

Disclosure supporting Claims 1 and 13 is identical in each of the last three applications referred to in paragraph 5 above, namely Serial No. 08/520,026, Serial No. 08/041,796 and Serial No. 07/722,340, and is found in the aforesaid U.S. Patent No. 5,556,501 as follows:

(a) a silicon dome (consisting of a silicon-comprising dome top 17T and a silicon-comprising sidewall 17S, which together act as a monolithic electrode) is disclosed at column 7 lines 33-38, thus supporting the element of "a window electrode proximal a wall of said chamber";

(b) a coil outside the dome 17 is disclosed at column 8 line 4-7, so that power from the coil necessarily must be inductively coupled through the dome, thus supporting the limitation of "a window electrode passing RF power therethrough" of Claim 1 for example;

(c) the role of the dome 17 as an anode electrode (with the pedestal being the cathode) is disclosed at column 21 lines 47-52, so that the dome necessarily provides capacitive coupling into the chamber, thus supporting the limitation of "a capacitive electrode..." of Claim 1, for example.

Concerning the dome 17 of Serial No. 08,041,796, its side wall 17S and top 17T are both conductive (semi-conductive silicon), so that they are both portions of the entire dome, so that RF bias power (or ground or a floating potential) applied to the top 17T is conducted throughout the entire electrode including the side wall 17S, so that the side wall 17S both has RF bias power applied directly to it while being simultaneously a window for the outer coil that is next to it.

The Table I as shown below sets forth the support for each element of Claims 1-18 in each of the applications in the chain

beginning in June 27, 1991 and ending with the parent of the present application.

TABLE I

	SERIAL NO. 07/722,340	SERIAL NO. 08/041,796 PAT. 5,556,501	SERIAL NO. 08/520,026	SERIAL NO. 08/648,254 PAT. 6,165,311	SERIAL NO. 08/733,555 PAT. 6,063,233	SERIAL NO. 09/350,234 PAT. 6,365,063
CLAIM 1						
LINES 1-4	P. 15, LINES 22-42	COL. 8, LINE 50 THROUGH COL. 9, LINE 4	SAME AS 07/722,340	COL. 10, LINES 36-39; COL. 10, LINES 1-3	COL. 10, LINES 50-53; COL. 10, LINES 15-17	COL. 9, LINES 56-59; COL. 9, LINES 21-23
LINES 5-9	P. 13, LINES 18-27	COL. 7, LINES 33-38	SAME AS 07/722,340	COL. 9, LINES 42-28	COL. 9, LINES 56-62	COL. 8, LINES 62-67
LINES 10-12	P. 37, LINES 16-21	COL. 21, LINES 47-52	SAME AS 07/722,340	COL. 15, LINES 64-67	COL. 16, LINES 16-19	COL. 15, LINES 21-24
LINES 13-15	P. 14, LINES 19-21; P. 15, LINES 22-25	COL. 8, LINES 4-7; COL. 8, LINES 50-54	SAME AS 07/722,340	COL. 15, LINES 67 THROUGH COL. 16, LINE 2	COL. 16, LINES 19-21	COL. 15, LINES 24-26
CLAIMS 2, 17, 18	P. 13, LINES 25-27	COL. 7, LINES 36-38	SAME AS 07/722,340	COL. 11, LINES 46-47	COL. 11, LINES 60-61	COL. 10, LINES 66-67
CLAIMS 3, 4, 6, 7, 14, 15	P. 40, LINES 36-38	COL. 23, LINES 31-33	SAME AS 07/722,340	COL. 16, LINES 66-67	COL. 17, LINES 36-37	COL. 16, LINES 41-42
CLAIM 5	P. 14, LINES 19-21	COL. 8, LINES 4-7	SAME AS 07/722,340	COL. 10, LINES 36-39	COL. 10, LINES 50-53	COL. 9, LINES 56-59
CLAIMS 8, 16	P. 37, LINES 16-21	COL. 21, LINES 47-52	SAME AS 07/722,340	COL. 9, LINES 42-48	COL. 9, LINES 56-62	COL. 8, LINES 62-67
CLAIMS 9, 11	P. 13, LINES 18-27	COL. 7, LINES 33-38	SAME AS 07/722,340	COL. 15, LINES 46-55; COL. 16, LINES 66-67	COL. 15, LINE 65; COL. 17, LINES 36-37	COL. 15, LINES 3-12; COL. 16, LINES 41-42
CLAIM 10	P. 15, LINES 22-42	COL. 8, LINE 50 THROUGH COL. 9, LINE 4	SAME AS 07/722,340	COL. 10, LINES 1-3 AND LINES 36-39	COL. 10, LINES 15-17 AND LINES 50-53	COL. 9, LINES 21-23 AND LINES 56-59
CLAIM 12	P. 14, LINES 19-21	COL. 8, LINES 4-7	SAME AS 07/722,340	FIG. 4D	FIG. 4D	FIG. 4D
CLAIM 13						
LINES 1-4, 6-7	P. 15, LINES 22-24	COL. 8, LINE 50 THROUGH COL. 9, LINE 4	SAME AS 07/722,340	COL. 10, LINES 36-39; COL. 10, LINES 1-3	COL. 10, LINES 50-53; COL. 10, LINES 15-17	COL. 9, LINES 56-59; COL. 9, LINES 21-23
LINE 5	P. 13, LINES 18-27	COL. 7, LINES 33-38	SAME AS 07/722,340	COL. 9, LINES 42-48	COL. 9, LINES 56-62	COL. 8, LINES 62-67

LINES 8-11	P. 37, LINES 16-21	COL. 21, LINES 47-52	SAME AS 07/722,340	COL. 15, LINES 64-67	COL. 16, LINES 16-19	COL. 15, LINES 21-24
LINES 12-15	P. 14, LINES 19-21; P. 15, LINES 22-25	COL. 8, LINES 4-7; COL. 8, LINES 50-54	SAME AS 07/722,340	COL. 15, LINES 67 THROUGH COL. 16, LINE 2	COL. 16, LINES 19-21	COL. 15, LINES 24-26
CLAIM 14	P. 14, LINES 19-21; P. 40, LINES 36-38	COL. 8, LINES 4-7; COL. 23, LINES 30-42	SAME AS 07/722,340	COL. 10, LINES 36-39; COL. 16, LINES 66-67	COL. 10, LINES 50-53; COL. 17, LINES 36-37	COL. 9, LINES 56-59; COL. 16, LINES 41-42

(2) CONTINUITY OF INVENTORSHIP:

The inventor of Claims 1-18 is Kenneth S. Collins, who is also a named inventor in each of these applications.

(3) CONTINUITY OF PROSECUTION:

Each successive application dating back to June 27, 1991 was co-pending with its parent at the time of filing. Therefore, there is continuity of disclosure, continuity of inventorship and continuity of prosecution, in compliance with 35 USC 120.

The June 27, 1991 filing date antedates the earliest possible effective date of the Blalock reference, namely June 2, 1994. Therefore, withdrawal of the rejection under 35 USC 102(e) of Claims 1, 3, 5, 6, and 9-14 is respectfully requested.

(B.) CLAIMS 19, 20 and 25:

Claims 19 (as amended) and Claim 20 specify that the window electrode forms a portion of the reactor enclosure or chamber wall. The Blalock electrode is a metal conductor, which MUST have the multiple slots 36 to avoid blocking the inductive field from the external coil. With such slots or apertures, the Blalock electrode cannot form a portion of the vacuum enclosure since the slots 36 would prevent any sealing of the chamber. Therefore, in Blalock, the slotted electrode does not form any portion of the vacuum enclosure. In contrast, the window electrode of Claims 19 and 20 must be a solid monolithic structurally strong piece to seal and withstand the vacuum within

the chamber. Of course, applicants' specification explains this feature is achieved by forming the window electrode as a semiconductor (e.g., silicon) wall. Therefore, Claims 19 and 20 are not anticipated by Blalock because Blalock cannot meet the limitation that the electrode form a portion of the chamber wall.

Claim 25 depends from Claim 20 and is therefore patentable upon the same basis.

Therefore, withdrawal of the rejection of Claims 19, 20 and 25 under 35 USC 102(e) is respectfully requested based upon the foregoing.

Claim Rejections - 35 USC § 103

First Rejection: Claim 18 is rejected under 35 USC 103(a) as being unpatentable over Sandhu (U.S. Patent No. 5,599,396), as applied to claims 1-17 and 19-26 above, and in further view of Wolf et al., "Silicon Processing for the VLSI Era, Volume 1: Process Technology". Referring to the attached Declaration of Kenneth S. Collins, Claim 18 is entitled to the June 27, 1991 filing date discussed above. This date precedes the earliest effective date of Blalock or Sandhu. Therefore, withdrawal of the rejections of Claim 18 under 35 USC 103(a) is respectfully requested.

Second Rejection: Claims 2, 4, 7-8, 15-17, 21-24, and 26 are rejected under 35 USC 103(a) as being unpatentable over Blalock (U.S. Patent No. 5,779,849) as applied to claims 1, 3, 5-6, 9-14, 19-20, and 25 above, and in further view of Sandhu (U.S. Patent No. 5,599,396).

(A.) CLAIMS 2, 4, 7, 8 and 15-17:

Claims 2, 4, 7, 8 and 15-17 are entitled to the June 27, 1991 filing date as discussed above with reference to the

attached Declaration of Kenneth S. Collins. This filing date antedates the earliest possible effective date Blalock or Sandhu. Therefore, Claims 2, 4, 7, 8 and 15-17 are patentable over the combination of Blalock and Sandhu.

(B.) CLAIMS 21-24 AND 26:

Claims 21-24 and 26 depend from Claim 20 and are therefore patentable upon the same basis. Claim 20 specifies that the window electrode forms a portion of the vacuum enclosure or chamber wall. As discussed above, Blalock cannot meet this limitation because Blalock's electrode must have the multiple slots or apertures 36 to avoid blocking the inductive field of the external coil. Sandhu cannot meet the limitation of a "window electrode" because Sandhu is either conductive (when the fluid is present) or non-conductive (in absence of the fluid) and, as disclosed, is therefore EITHER a window (when non-conductive) OR an electrode (when conductive), but it is not simultaneously a "window electrode". The Examiner's allegation that Sandhu teaches a semiconductive state of his electrode is wrong. Sandhu discloses only a conductive state or a non-conductive state for use, and NEVER recognizes the possibility of operating his electrode in an in-between state. Such a feature can only be foisted upon Sandhu's teachings with the impermissible hindsight of the applicants' invention.

In its conductive state, the Sandhu electrode blocks the inductive field of the external coil from the chamber interior due to eddy currents formed in the conductive surface. This is the reason Sandhu uses a conductive fluid that can be withdrawn from his electrode. Such eddy currents are avoided in Blalock by the introduction of the multiple apertures or slots 36 in his conductive layer, the slots tending to suppress such eddy currents that would otherwise absorb the power from the inductive field of the coil.

Thus, Claims 21-24 and 26 are patentable over the combination of Blalock and Sandhu, and reconsideration of the rejection of Claims 21-24 and 26 under 35 USC 103(a) is respectfully requested based upon the language in Claim 20 specifying a window electrode (which Sandhu cannot meet because his is EITHER a window or an electrode but never both simultaneously) that forms a portion of the chamber wall (which Blalock cannot meet because his slots 36 would represent large leaks in the vacuum enclosure or wall).

Double Patenting

Claims 1-26 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-67 of U.S. Patent No. 6,077,384.

Applicants submit herewith a Terminal Disclaimer to overcome the double-patenting rejection.

Summary

In view of the foregoing corrections and remarks, it is felt that the objection to the claims and the rejection of the claims under 35 USC 102(e), and 103(a) have been overcome and all the claims are patentable over the cited references. Therefore, withdrawal of these rejections is respectfully requested and allowance of the application is earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the application, the Examiner should telephone

Robert Wallace at (805) 644-4035 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the specification:

Paragraph beginning at line 19 of page 1 has been amended as follows:

Related Applications:

This application is a divisional of U.S. Patent application Serial No. 09/350,234, filed July 9, 1999 entitled "Plasma Reactor Having A Dual Mode RF Power Application" (currently pending), which is a continuation of application Serial No. 08/733,555, filed October 1, 1996 (now issued as Patent No. 6,063,233), which is a continuation-in-part of application Serial No. 08/648,254, filed May 13, 1996 (now issued as Patent No. 6,165,311), which is a continuation-in-part of application Serial No. 08/580,026, filed December 20, 1995 (currently pending), which is a continuation of application Serial No. 08/041,796, filed April 1, 1993 (now abandoned), which is a continuation of application Serial No. 07/722,340, filed June 27, 1991 (now abandoned)[, which is]. This application is furthermore a continuation-in-part of application Serial No. 08/503,467, filed July 18, 1995 (now issued as Patent No. 5,770,099), which is a divisional of application Serial No. 08/138,060, filed October 15, 1993 (now issued as Patent No. 5,477,975)[, which is]. This application is furthermore a continuation-in-part of application Serial No. 08/597,577, filed February 2, 1996 (now issued as Patent No. 6,077,384), which is a continuation-in-part of application Serial No. 08/521,668, filed August 31, 1995 (now abandoned), which is a continuation-in-part of application Serial No. 08/289,336, filed August 11, 1994 (now abandoned), which is a

Continuation of application Serial No. 07/984,045, filed December 1, 1992 (now abandoned). In addition, U.S. application Serial No. 08/648,265 filed May 13, 1996 (now issued as Patent No. 6,165,311) discloses related subject matter.

In the claims:

Claim 1 has been amended as follows:

1. (Once Amended) For use in a plasma reactor including a plasma reactor chamber, a workpiece support for holding a workpiece inside said chamber during processing and an inductive antenna, an article comprising:

a window electrode proximal a wall of said chamber, said antenna and wall being positioned adjacently, said window electrode being operable as:

(a) a capacitive electrode accepting RF power to capacitively couple plasma source power into the chamber, and

(b) a window electrode passing RF power therethrough from said antenna into said chamber to inductively couple plasma source power into the chamber.

Claim 19 has been amended as follows:

19. (Once Amended) A plasma reactor comprising:

a plasma reactor chamber enclosed by a vacuum enclosure wall and a workpiece support for holding a workpiece within the interior of said chamber during processing, and a window

electrode facing the interior of said chamber, said window electrode forming a portion of said vacuum enclosure wall;

an inductive plasma source power applicator overlying said window electrode;

at least one RF plasma source power supply;
said reactor being operable in each one of two modes, said modes comprising:

(a) a capacitively coupled plasma mode wherein said RF plasma source power supply is coupled to said window electrode, and

(b) an inductively coupled plasma mode wherein said RF plasma source power supply is coupled to said inductive power applicator instead of said window electrode.

Claim 27 has been added as follows:

27. (New) The reactor of Claim 13 wherein said plasma reactor chamber comprises a vacuum enclosure wall, and said window electrode comprises a section of said wall that is adjacent said inductive source power applicator.